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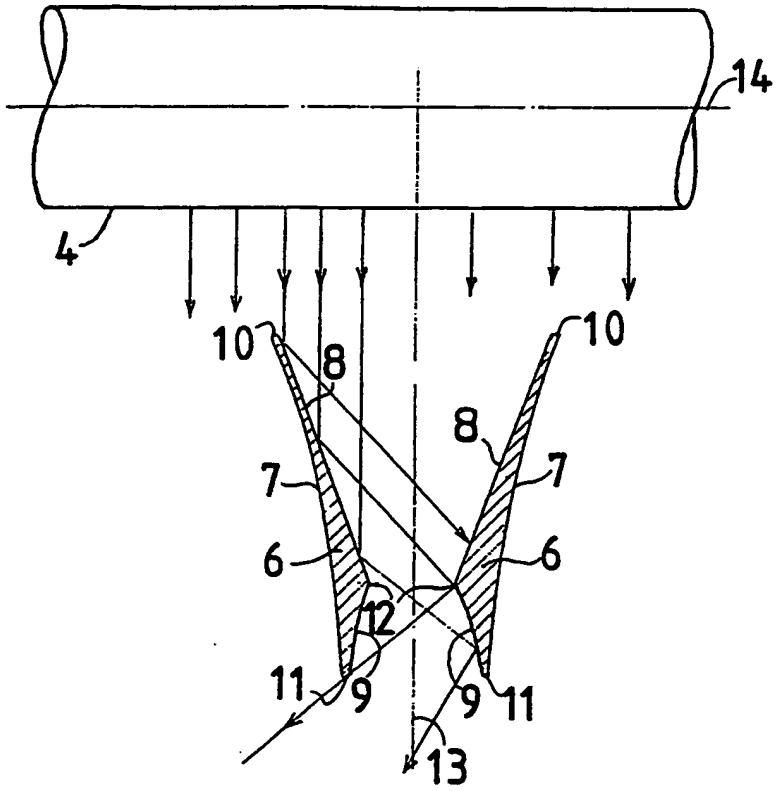
(57) Abstract

A fixture device for luminous tubes, preferably of the ceiling-mounted kind, is equipped with a new type of transverse lamellas or fins (6) on the underside for shielding and distribution of the light from said fixture. The transverse fins (6) are constructed as pairs of single fins, with a mirror symmetrical design about a center plane for each pair. The distance between two single fins (6) in one pair is smaller than the distance from a single fin to the nearest single fin in the adjacent pair. The fins (6) are preferably equipped with outer reflection surfaces (7) with parabolic curvature, and the inner reflection surfaces in a pair are divided in two areas in such a manner that the lower area (9) of the inner reflection surface has the same curvature type as the outer reflection surface (7).



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IMPROVEMENT IN FIXTURES FOR LUMINOUS TUBES

The present invention relates to an improvement in fixtures for luminous tubes or bulbs, and more specifically an improved version of the transverse lamellas or fins in the light shielding grid of the fixture.

In an early stage it was realized that ceiling-mounted illumination with luminous bulbs could be provided with an opportune and comfortable design or mode of operation by fitting the fixture with a light shielding grid which provides a downward directing of the light by shielding and reflections. In their simplest form, such grid devices will, in addition to side and end reflectors intended for reflecting light mainly downward, be equipped with simple crossbar-like transverse fins in the form of vertically upright plates just below the luminous bulb or bulbs, mounted in a suitable number between the side reflectors, and with number, height and interval distance adapted for maximum allowable light scatter angle, maximum desirable construction height of the fixture etc.

It was also soon realized that the lighting conditions below a fixture could be improved further by introducing an improved type of transverse fins, namely (in cross section) Y- or V-shaped fins with concavely curved outer sides, often with parabolic type of curvature. Using such a design, improved darkening or shielding conditions are achieved, even though the light output or efficiency will be somewhat lower due to loss "inside" the fins or lamellas.

European patent application no. 138.747 discloses an example of such V-shaped transverse fins. In addition, the fins shown in said European application are designed with a three-dimensional curvature in the reflecting surfaces in order to improve the shielding conditions regarding obliquely reflected light rays.

Other variants have been developed, and it is referred to the enclosed figures 2, 3 and 4 which show previously known shapes of transverse lamellas. Fig. 2 corresponds approximately to the above mentioned cross-sectional shape. Fig. 3 shows a closed top part of the V-fin, for achieving a reflection

back again of the light, which then entails a higher light yield from the fixture due to inter-reflections which pass the upward reflected light from the fins, down again. However, some loss still exists. The structure shown in fig. 4 provides a good increase of the light yield, but this implies the disadvantage of increasing the fixture construction height with a height difference of H2-H.

The purpose of the present invention is to provide a fixture with transverse lamellas or fins which results in a corresponding increase in the light yield as the last mentioned variant, however without increasing the construction height in comparison with the variants of fig. 2 and 3. Said purpose is fulfilled by providing a luminous bulb fixture of the kind precisely defined in the enclosed patent claims.

A closer description of the invention shall be given in the following, referring to the embodiment example appearing from fig. 5 and 6,

fig. 1 showing a general design of a luminous bulb fixture of previously known type in a perspective view, obliquely from below,

fig. 2-4 showing cross sections of the alreday mentioned previously known shapes of transverse lamellas,

fig. 5 showing a corresponding cross section of a pair of fins or lamellas constituting part of the present invention, and

fig. 6 showing in a schematical manner light ray conditions in connection with a fixture in accordance with the invention.

It should first be noted that the following description for simplicity reasons merely mentions horizontal mounting of the fixture, that is the usual ceiling mounting, however, it is also of course possible with other mounting conditions (slanting ceilings, or even on walls). The patent claims have been worded in a manner which is independent of horizontal mounting of the luminous bulb, i.e. independent of fixture position.

Fig. 1 shows a ceiling mounted fixture with one single luminous tube 4. The fixture is equipped with side reflectors 1, end reflectors 2 and quite simple plate-shaped transverse fins 3 for shielding and downward directing of the light from

the luminous tube or bulb. As a starting point, here the height of each fin or lamella 3, as well as the distance between fins, determine the maximum angle with the vertical direction for escaping light rays in the case of a direct reflection, however multiple reflections imply a much wider scatter angle and poorer control of the darkening conditions.

In figs. 2, 3 and 4 which have been mentioned above, reference numeral 5 refers to more advanced designs of fins or lamellas, where the result is a poorer light yield than in the first case, however in return, better control of the shielding angle is achieved, and consequently more correct and comfortable illumination conditions. As previously mentioned, the solution in fig. 4 gives the better light yield, but the problem in this case is the increased construction height, which is usually not desirable.

In fig. 5 is shown a lamella example in accordance with the present invention. The same external geometry as in the V-shapes in figs. 2, 3 and 4 has been retained, i.e. preferably a parabolic curvature type for the the outer surfaces 7. However, the previous "V"-lamella has now been spilt into two single fins 6 in a mirror symmetrical relation, in such a manner that light can pass also "inside" or "through" the pair of fins 6-6. On the inside, surfaces 8 and 9 are of a reflecting type in the same manner as the outer surfaces 7. The upper and lower edges are shown respectively with reference numerals 10 and 11. 12 indicates an edge line (into the paper plane) separating the two inner surfaces 8 and 9. An imaginary symmetry plane in the center is indicated by reference numeral 13, and is positioned perpendicularly to the luminous tube or bulb. Reference numeral 14 indicates the axis of the luminous bulb.

The inner surfaces 8 are either flat or shaped with a slightly convex curvature type. Preferably the lower inner surfaces 9 have the same curvature type as the outer surfaces 7, however in a re-scaled, i.e. reduced version, so that the radius of curvature varies in the same manner, but is scaled down with a fixed factor.

The upper inner surface 8 follows to a larger or smaller extent the curve of the lamella outside 7, however deviates

slowly in a downward direction, either by a somewhat different curvature, or by being a flat surface, so that the "inversly curved" lower inner surface 9 starts from an edge 12 and curves back to the lower end edge 11.

The distance between the single fins 6 in a fin pair is adjusted in such a manner that the same maximum exit angle is achieved also for light passing through said pair, as for light passing either directly or via reflections between the pairs. This is achieved by a proper choice of dimensions, as will be dealt with in more detail below.

The splitting up of tranverse lamellas of the V-type in two parts, so that light passes also "through" the lamella, either directly or via reflections, as indicated in the present invention, increases the efficiency of the fixture without renouncing the requirements for technical illumination characteristics.

Fig. 6 shows examples of oblique ray passage through a grid of transverse lamellas 6 in accordance with the present invention. If a maximum light exit angle α with the vertical direction is desirable, and the construction height implies a maximum lamella height H, the new lamellas or fins are placed with a distance from one lamella pair to the next pair equal to B, so that $\tan \alpha = B'/H$ where B' is the horizontal distance from the top of one lamella or fin to the lower edge of the closest lamella or fin in the adjacent pair of fins. With the curvature type in question, it is then ensured that any light ray in the space between pairs is reflected downward and out from the grid with an angle equal to or smaller than α.

Regarding the light passage "inside" a pair of fins, the preferred solution ensures, with regard to the lower reflection surfaces 9, that the same maximum exit angle α is obtained, and at the same time the total light yield is increased substantially in relation to the previously known solutions.

In order to achieve the same maximum angle α, the distance A is adjusted in the preferred embodiment with similar surfaces 9 as the surfaces 7, in such a manner that the ratio A'/h, h being the height from the lower edge 11 to the edge 12, and A'

being the horizontal distance between lower edge 11 and inside edge 12 for two respective lamellas in a pair, equals tan α.

Thus, in this case, the two geometrical figures marked S-S-S-S and L-L-L-L in fig. 6, will be similar.

Any light ray, directly or indirectly from the light source, is thus reflected from surfaces 7 or 9 with an angle β which is smaller than or equal to α.

P A T E N T C L A I M S

1. An improved fixture means for luminous tubes or bulbs, said fixture being equipped with a light shielding grid consisting of side reflectors (1), end reflectors (2) and transverse fins or lamellas (6), said fins or lamellas (5) having curved and possibly flat reflection surfaces (7, 8, 9), c h a r a c t e r i z e d i n that said transverse fins (6) are arranged two by two in pairs where single fins (6) in a pair are constructed in a mutually mirror symmetrical fashion about a plane (13) perpendicular to the axis (14) of the luminous tube and the distance A between two single fins (6) in a pair is smaller than the distance B from one single fin to the closest single fin in an adjacent pair.

2. Fixture means in accordance with claim 1, c h a r a c t e r i z e d in that each single fin (6) is shaped like a substantially thin and flat, however curved and thickness-wise structured plate with two principal sides (7, 8/9).

3. Fixture means in accordance with claim 2, c h a r a c t e r i z e d i n that the two principal sides (7, 8/9) of one single fin (6) have different curvature conditions.

4. Fixture means in accordance with claim 3, c h a r a c t e r i z e d i n that that principal side (7) which for the pair in question is an outer side, has a concave and two-dimensional curvature along its complete extent in a direction perpendicular to the luminous tube or tubes (4), as viewed in that cross section through said fin (6) which also contains a luminous tube axis (14) and is vertically upright when said luminous tube (4) is placed horizontally, which outer side is uniformly shaped in the direction of view for said cross section.

5. Fixture means in accordance with claim 4, c h a r a c t e r i z e d i n that that principal side (8/9) which for the pair in question is an inside, is divided into two areas (8 resp. 9), where an area (8) proximal to the luminous tube substantially follows the curvature of the outer side (7), and is either curved convexly and slightly deviating therefrom, or substantially flat, and where an area (9) distal to the luminous tube has a concave curvature from a sharply marked area transition edge (12) to the single fin edge (11) which is distal to said luminous tube.

6. Fixture means in accordance with claim 5, c h a r a c t e r i z e d i n that said area (9) distal to the luminous tube has a curvature of the same type as the single fin outer side (7), however with reduced radius or radii of curvature.

7. Fixture means in accordance with claim 6, c h a r a c t e r i z e d i n that the geometrical dimensions are chosen in such a manner that the trapezium-like figures appearing in said cross section when their delimitation line is constituted by

a) the two areas (9) distal from the luminous tube and on the insides of the single fins (6) of one pair of fins, the imaginary connection line parallel to the luminous tube and between the two area transition edges (12) in the pair and the imaginary connection line parallel to the luminous tube and between the two edges (11) of the single fins (6) distal from the luminous tube,

and

b) the two fin outer sides (7) facing each other for two adjacent pairs of fins, the imaginary connection line parallel to the luminous tube and between the corresponding fin edges (10) proximal to the luminous tube, and the imaginary connection line between the corresponding fin edges (11) distal from the luminous tube,

are similar geometrical figures with a predetermined magnitude ratio.

8. Fixture means in accordance with any of the preceding claims,
c h a r a c t e r i z e d i n that the curved reflection surfaces (7, 9) have a parabolic curvature type.

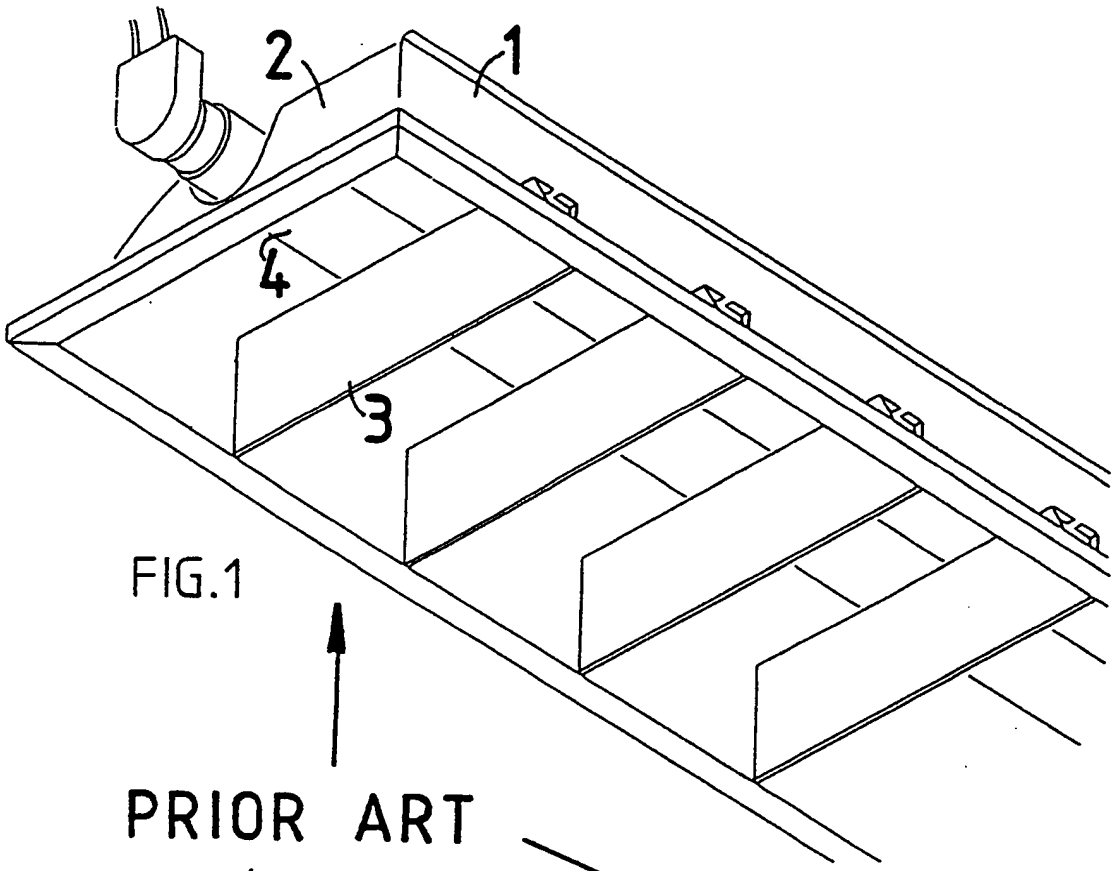

FIG.1

PRIOR ART

FIG.2

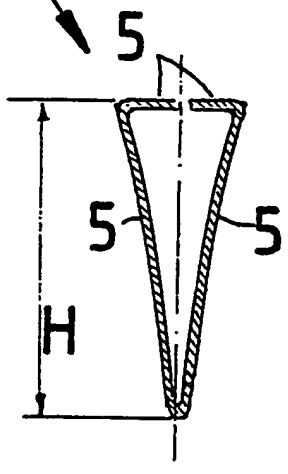

FIG.3

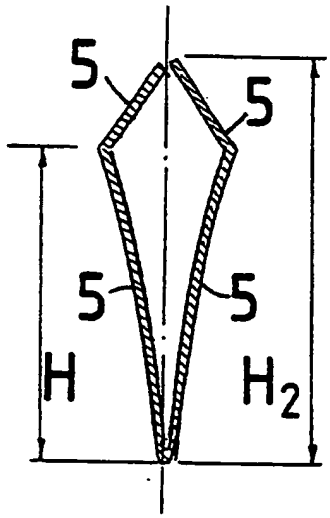

FIG.4

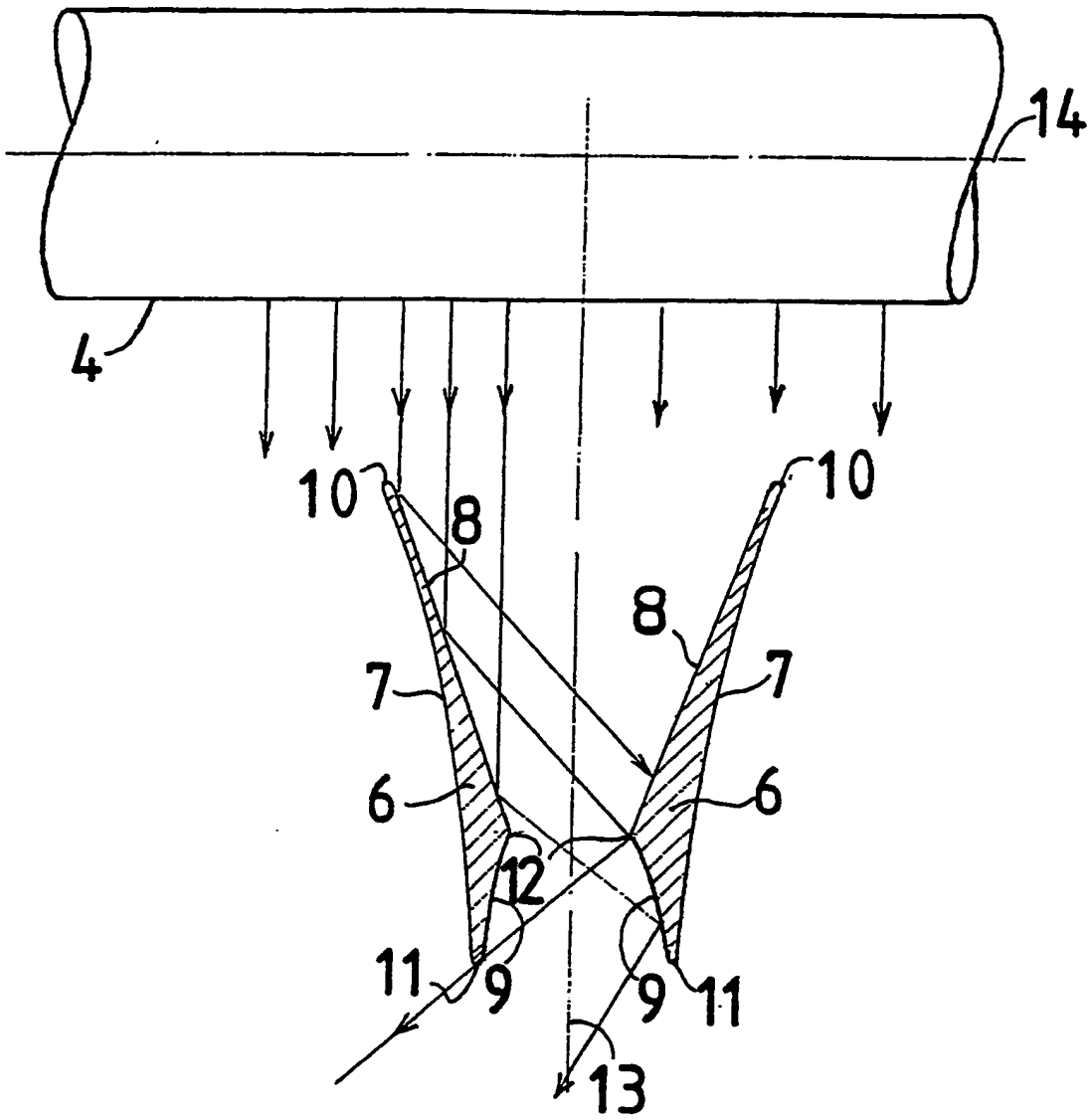

FIG. 5

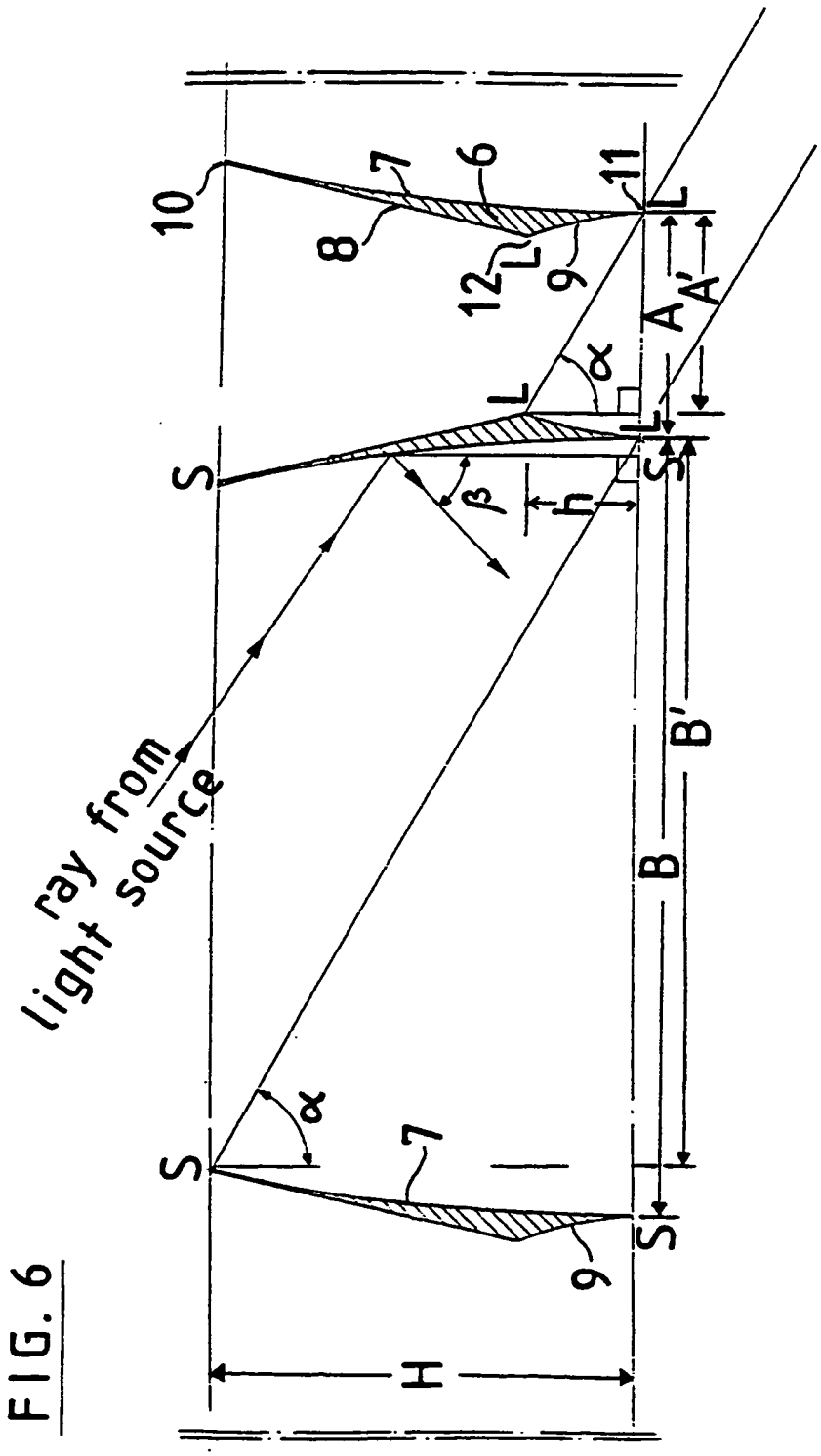

FIG. 6

INTERNATIONAL SEARCH REPORT

International Application No PCT/NO 90/00061

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: F 21 V 11/02

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
IPC5	F 21 V

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched[8]

SE,DK,FI,NO classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
A	DE, U1, 1984108 (GÜNTHER GUBELA) 25 April 1968, see figures 2-3,6 --	1,8
A	EP, A1, 159534 (TRILUX-LENZE GMBH & CO KG) 30 October 1985, see the whole document -- --------	1-8

* Special categories of cited documents: [10]

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
31st May 1990	Åke Vängborg 1990 -07- [illegible]
International Searching Authority	**Signature of Authorized Officer**
SWEDISH PATENT OFFICE	Åke Vängborg

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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. PCT/NO 90/00061

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-U1- 1984108	68-04-25	NONE	
EP-A1- 159534	85-10-30	NONE	